

## New claims (Annex 1 to IPR)

1. Lifting mechanism (100) with a hydraulic control and adjustment system and a working tool (6) in a mobile machine with at least a first and second lifting cylinder (61, 62), in which cylinder pistons (63, 65) are displaceable, the position or direction of movement of which in the lifting cylinders (61, 62) fix the lifting height or the vertical direction of movement of the working tool (6) relative to a vehicle body (4) of the mobile machine, wherein each of the cylinder pistons (63, 65) divides the associated lifting cylinder (61, 62) into two adjusting pressure chambers (67 and 68, 69 and 70) in each case and with a first hydraulic pump (75), adjustable in respect of the discharge volume, the first connection (74) of which is connected depending on the vertical direction of movement of the working tool (6) to one of the adjusting pressure chambers (67) of the first lifting cylinder (61) and one of the adjusting pressure chambers (69) of the second lifting cylinder (62) and the second connection (77) of which is connected in a closed circuit to the other adjusting pressure chamber (68) of the first lifting cylinder (61) and the other adjusting pressure chamber (70) of the second lifting cylinder (62),
- characterised in that**
- a piston side adjusting pressure chamber (67) of the first lifting cylinder (61) is connected to a piston rod side adjusting pressure chamber (69) of the second lifting cylinder (62) via a first hydraulic line (71) and a piston rod side adjusting pressure chamber (68) of the first lifting cylinder (61) is connected to a

piston side adjusting pressure chamber (70) of the second lifting cylinder (62) via a second hydraulic line (72) and the first lifting cylinder (61) and the adjusting piston (65, 143) of the second lifting cylinder (62) are connected to a boom (64) connecting the working tool (6) to the vehicle body (4) of the mobile machine and the second lifting cylinder (62) and the adjusting piston (63, 142) of the first lifting cylinder (61) are connected to the body (4) of the mobile machine.

2. Lifting mechanism according to claim 1, **characterised in that** in each case a first adjusting pressure chamber (68; 69) borders on the associated cylinder piston (63; 65) with a pressurisation face (A1) which is smaller than the pressurisation face (A2) with which the other second adjusting pressure chamber (67; 70) in each case borders on the corresponding cylinder piston (63; 65) and in that each connection (74; 77) of the hydraulic pump (75) is connected to a first adjusting pressure chamber (68; 69) with a smaller pressurisation face (A1) and a second adjusting pressure chamber (70; 67) with a larger pressurisation face (A2).

3. Lifting mechanism according to claim 1 or 2, **characterised in that** the two boom side adjusting pressure chambers (144, 146) of the first and second lifting cylinders (61, 62) are connected via a first hydraulic line (151) and the two vehicle body side adjusting pressure chambers

(145, 147) of the first and second lifting cylinders (61, 62) via a second hydraulic line (152).

4. Tilting mechanism (200) with a hydraulic control and  
5 adjustment system and with a loading shovel (6)  
serving as a working tool (6) in a mobile machine with  
at least a first and second shovelling cylinder (1,  
2), in which cylinder pistons (3, 5) are displaceable,  
the position or direction of movement of which in the  
10 shovelling cylinders (1, 2) fix the tilting angle or  
the tilting direction of the loading shovel (6)  
relative to a vehicle body (4), wherein each of the  
cylinder pistons (3, 5) divides the associated  
shovelling cylinder (1, 2) into two adjusting pressure  
15 chambers (7 and 8, 9 and 10) in each case, and with a  
second hydraulic pump (15), adjustable in respect of  
the discharge volume, the first connection (14) of  
which is connected depending on the tilting direction  
of the loading shovel (6) to one of the adjusting  
20 pressure chambers (7) of the first shovelling  
cylinder (1) and one of the adjusting pressure  
chambers (10) of the second shovelling cylinder (2)  
and the second connection (17) of which is connected  
in a closed circuit to the other adjusting pressure  
25 chamber (8) of the first shovelling cylinder (1) and  
the other adjusting pressure chamber (9) of the second  
shovelling cylinder (2),  
**characterised in that**  
the piston side adjusting pressure chamber (7) of the  
30 first shovelling cylinder (1) is connected to the  
piston rod side adjusting pressure chamber (10) of the  
second shovelling cylinder (2) via a first hydraulic  
line (11) and the piston rod side adjusting pressure

chamber (8) of the first shovelling cylinder (1) is connected to the piston side adjusting pressure chamber (9) of the second shovelling cylinder (2) via a second hydraulic line (12) and the first shovelling cylinder (1) and the adjusting piston (5, 131) of the second shovelling cylinder (2) are connected to the loading shovel (6) and the second shovelling cylinder (2) and the adjusting piston (3, 130) of the first shovelling cylinder (1) are connected to the body (4) of the mobile machine.

5. Tilting mechanism according to claim 4,  
**characterised in that**
- in each case a first adjusting pressure chamber (8; 10) borders on the associated cylinder piston (3; 5) with a pressurisation face (A1) which is smaller than the pressurisation face (A2) with which the other second adjusting pressure chamber (7; 9) in each case borders on the corresponding cylinder piston (3; 5) and in that each connection (14; 17) of the hydraulic pump (15) is connected to a first adjusting pressure chamber (10; 8) with a smaller pressurisation face (A1) and a second adjusting pressure chamber (9; 7) with a larger pressurisation face (A2).
6. Tilting mechanism according to claim 4 or 5,  
**characterised in that**
- the two loading shovel side adjusting pressure chambers (132, 134) of the first and second shovelling cylinders (1, 2) are connected via a first hydraulic line (136) and the two vehicle body side adjusting pressure chambers (133, 135) of the first and second

shovelling cylinders (1, 2) via a second hydraulic line (137).

- 5 7. Lifting and tilting mechanism according to claim 1 and 4,

**characterised in that**

the discharge direction of the first hydraulic pump (75) operating in two-quadrant operation fixes  
10 the vertical direction of movement of the working tool (6) or the discharge direction of the second hydraulic pump (15), likewise operating in two-quadrant operation, fixes the tilting direction of the loading shovel (6).

15

8. Lifting and tilting mechanism according to claim 1 and 4,

**characterised in that**

the discharge volume discharged at the first and  
20 second connections (74, 77) of the first hydraulic pump (75) fixes the lifting height of the working tool (6) or the discharge volume discharged at the first and second connection (14, 17) of the second hydraulic pump (15) fixes the tilting angle of the loading  
25 shovel (6).

9. Lifting and tilting mechanism according to claim 8,  
**characterised in that**  
the adjustment of the discharging device of the second  
30 hydraulic pump (15) and the discharge volume discharged at the first and second connections (14, 17) of the second hydraulic pump (15) is done as a function of a deflection set on a steering

instrument (52) constructed in the manner of a joystick in a first deflection dimension and the setting of the direction of rotation of the first hydraulic pump (75) and the adjusting pressure built up at the first and second connections (74, 77) of the first hydraulic pump (75) is done as a function of a deflection set on the steering instrument (52) constructed in the manner of a joystick in a second deflection dimension.

10

10. Lifting and tilting mechanism according to claim 9, **characterised in that**

a first adjusting valve (41) is actuated as a function of the deflection of the steering instrument (52) in the first deflection dimension and a second adjusting valve (102) is actuated as a function of the deflection of the steering instrument (52) in the second deflection dimension.

11. Lifting and tilting mechanism according to claim 10, **characterised in that**

the deflection of the first adjusting valve (41) is done by electric adjusting magnets on control connections (49, 50) of the first adjusting valve (41), wherein one control connection (49) receives a first electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the first deflection dimension, corresponding to the tilting inwards movement, and the other control connection (50) receives a second electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the first deflection dimension, corresponding to the tilting

outwards movement, from a transformer of the steering instrument (52) and in that the deflection of the second adjusting valve (102) is done by electric adjusting magnets at control connections (110, 111) of the second adjusting valve (102), wherein one control connection (110) receives a third electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the second deflection dimension, corresponding to the lifting movement, and the other control connection (111) receives a fourth electric signal, corresponding to the deflection of the steering instrument (52) in the direction of the second deflection dimension, corresponding to the lowering movement, from a transformer of the steering instrument (52).

12. Lifting and tilting mechanism according to claim 10, **characterised in that**
- the deflection of the first adjusting valve (41) is done by adjusting pressures generated by a pilot control device (130) from the deflection of the steering instrument (52) in the first deflection dimension and supplied to control chambers located at the two control connections (49, 50) of the first adjusting valve (42) and the deflection of the second adjusting valve (102) is done by adjusting pressures generated by the pilot control device (130) from the deflection of the steering instrument (52) in the second deflection dimension and supplied to control chambers located at the two control connections (110, 111) of the second adjusting valve (102).

13. Lifting and tilting mechanism according to claim 12,  
**characterised in that**  
via a first pair of pressure reducing valves (143)  
consisting of two pressure reducing valves (139, 140),  
5 the inputs of which are connected in each case to a  
high pressure side connection (24) of a first feed  
pump (19), and a hydraulic tank (138) which generates  
adjusting pressures corresponding to the deflection of  
the steering instrument (52) in the two directions of  
10 the first deflection dimension, the pilot control  
device (130) generates corresponding adjusting  
pressures for actuating the first adjusting valve (42)  
and via a second pair of pressure reducing  
valves (144), consisting of two pressure reducing  
15 valves (141, 142), the inputs of which are connected  
in each case to a high pressure side connection (24)  
of a first feed pump (19) and a first hydraulic  
tank (138) which generates adjusting pressures  
corresponding to the deflection of the steering  
20 instrument (52) in the two directions of the second  
deflection dimension for the second adjusting  
valve (102).
14. Lifting and tilting mechanism according to one of  
25 claims 10 to 13,  
**characterised in that**  
the first and second adjusting valve (41, 102) is in  
each case a 4/3 port directional control valve,  
wherein the first input connection (44, 105) of the  
30 first adjusting valve (41) is connected to the high  
pressure side connection (24) of the first feed  
pump (19), the first input connection (105) of the  
second adjusting valve (102) is connected to a high



pressure side connection (84) of a second feed pump (79), the second input connection (46, 107) of the first and second adjusting valves (41, 102) is connected in each case to a hydraulic tank (48, 109),  
5 the first output connection (40) of the first adjusting valve (41) is connected to a first adjusting pressure chamber (37) of a first adjusting device (35), the first output connection (101) of the second adjusting valve (102) is connected to a first  
10 adjusting pressure chamber (97) of a second adjusting device (95), the second output connection (43) of the first adjusting valve (41) is connected to a second adjusting pressure chamber (38) of a first adjusting device (35) and the second output connection (104) of  
15 the second adjusting valve (102) is connected to a second adjusting pressure chamber (98) of a second adjusting device (95).

15. Lifting and tilting mechanism according to claim 14,  
20 **characterised in that**  
adjustment of the second hydraulic pump (15) in respect of the discharge direction and the discharge volume discharged at the first and second connection (14, 17) is done by the first adjusting device (35)  
25 and adjustment of the first hydraulic pump (75) in respect of the discharge direction and the discharge volume discharged at the first and second connections (74, 77) by the second adjusting device (95).

30 16. Lifting and tilting mechanism according to one of claims 13 to 15,  
**characterised in that**

the second hydraulic pump (15) and the first feed pump (19) or the first hydraulic pump (75) and the second feed pump (79) are driven by a common shaft (18, 78) in each case of a common or in each case separate machine, in particular by a diesel aggregate.

17. Lifting and tilting mechanism according to one of claims 13 to 16,  
**characterised in that**  
a low pressure side connection (20) of the first feed pump (19) is connected via a filter (22) to a hydraulic tank (23), a low pressure side connection (80) of the second feed pump (79) via a filter (82) to a hydraulic tank (83), the high pressure side connection (24) of the first feed pump (19) via a check valve (29, 30) in each case to a first hydraulic load line (13) attached to a first connection (14) of the second hydraulic pump (15) and to a second hydraulic load line (16) attached to a second connection (17) of the second hydraulic pump (15) and the high pressure side connection (84) of the second feed pump (79) via a check valve (89, 90) in each case to a third hydraulic load line (73) attached to a first connection (74) of the first hydraulic pump (75) and to a fourth hydraulic load line (76) attached to a second connection (77) of the first hydraulic pump (75).
18. Lifting and tilting mechanism according to claim 17,  
**characterised in that**

a check valve (55, 116) with an opener (58, 129) is provided in the first and third hydraulic load lines (13, 73) in each case.

- 5 19. Lifting and tilting mechanism according to claim 18,  
**characterised in that,**  
after transformation into a corresponding pressure,  
the second electric adjusting signal actuates an  
opener (58) of the check valve (55) integrated in the  
10 first hydraulic load line (13) and, after  
transformation into a corresponding pressure, the  
fourth electric adjusting signal actuates an  
opener (129) of the check valve (116) integrated in  
the third hydraulic load line (73).  
15
20. Lifting and tilting mechanism according to claim 17,  
**characterised in that**  
the second adjusting pressure generated by the pilot  
control device (130) actuates an opener (58) of the  
20 check valve (55) integrated in the first hydraulic  
load line (13) and the fourth adjusting pressure  
generated by the pilot control device (130) actuates  
an opener (129) of the check valve (116) integrated in  
the third hydraulic load line (73).  
25
21. Lifting and tilting mechanism according to claim 17,  
**characterised in that**  
located between the third and fourth hydraulic load  
lines (73, 76) is a 2/2 port directional control  
30 valve (119) which opens in the operating state  
"floating position" of the boom (64) by applying an  
electric signal to an electric adjusting magnet  
located at the control input (121) of the 2/2 port

directional control valve (119) or alternately by applying an adjusting pressure in a control chamber located at the control input (121) of the 2/2 port directional control valve (119).

5

22. Lifting and tilting mechanism according to claim 17,  
**characterised in that**

the third hydraulic load line (73) is connected via a hydraulic line (128) to a hydraulic control  
10 arrangement (125) to damp pitching oscillations of the working tool (6) while the mobile machine is travelling.

23. Lifting and tilting mechanism according to claim 22,  
15 **characterised in that**

an electric signal corresponding to the speed of the mobile machine is conducted from a tachogenerator (126) of the mobile machine to the input (127) of the hydraulic control arrangement (125) to damp pitching  
20 oscillations of the working tool (6) while the mobile machine is travelling.